ICS 2O0
Unit 1 - Hardware

Worksheet: Microprocessors & CPUs

Watch the following videos on microprocessors and silicon chip production:

How It's Made: Microprocessors
From Sand to Chip – How a CPU is Made

The following resources may also be useful in answering the questions below.

http://computer.howstuffworks.com/computer-hardware-channel.htm
http://en.wikipedia.org/wiki/Personal_computer_hardware
https://www.howtogeek.com/194756/cpu-basics-multiple-cpus-cores-and-hyper-threading-explained/

Fill in your responses in the yellow areas of the document. The yellow areas will automatically expand to accept longer answers.

Remember to hit "Turn In" once you are finished.

What is a microprocessor?

The microprocessor is the brain of a computer, the microprocessor is responsible for organizing and executing every instruction. The microprocessor contains the CPU (Central Processing Unit) and Cache memory.

What does CPU stand for? Central Processing Unit.

What does the CPU do?

The CPU (Central Processing Unit) interprets commands from a program that is currently running. These may involve:

Arithmetic operations

- Adding, Subtracting, Multiplying, or Dividing

Moving data between components

- Sending packets of data to the WiFi hardware

Switching context between programs

- Loading a website on Chrome, then responding to keystrokes in Word, then going back to Chrome, etc.

ICS 2O0
Unit 1 - Hardware

What is the difference between a microprocessor and the CPU?

The difference between a microprocessor and the CPU is tha the central processing unit sends instruction to the other components of a PC and makes logical decisions for the PC whereas the microprocessor surrounds the CPU and other components like the graphics card, sound card, networking card etc.

What is the significance of the clock speed for the microprocessor?

The significance of the clock speed for the microprocessor is that the higher the clock speed is, the faster the microprocessor or CPU can execute instructions. Usually, the clock speed is measured in 1 Mhz representing 1 million cycles per second or 1 GHz representing 1 billion cycles per second.

How many CPUs, or cores, might a personal computer have?

A personal computer might have quad-core (four cores).

What does it mean to have multiple cores/CPUs, and how does this improve the computer?

Having multiple CPUs/cores means that the computer can do operations at one time. This will improve the computer to run multiple programs or operation fast and more efficient at one time.

What is hyper threading?

Hyper threading allows a single core to perform or act like a multi-core processor. This is done by keeping the processor busy or/and active programs so that programs so that the program that takes a long time will not slow down the processor.

Why is hyperthreading not the same as doubling your processor cores?

Hyperthreading is not the same as doubling the processor core because hyperthreading act like it has multi-cores when it only has 1 physical core whereas multi-cores physically have 2 or more physical cores.

What is turbo boost?

Turbo boost is used to temporarily increase the processor's clock speed, which is a result increase of a computer's performance

What is the special memory used only by the CPU?

The special memory used only by the CPU is cache memory. This memory is located on the microprocessor near the CPU.

Where is this memory located?

What are the different types of this special memory?

Different types of this special memory are:

Level 1 (L1) Cache

- smallest but fastest memory available
- each core has its own L1 cache

Level 2 (L2) Cache

- slower but larger
- each core also has its own L2 Cache

Level 3 (L3) Cache

- slowest and largest
- shared by all cores

Read through the site:
http://www.trustedreviews.com/opinion/best-intel-processor-core-i3-i5-i7-2937692 What are the differences between the three types?

The difference between the three types are that some of them have different generations, different codes, different clock cycles rates, different prices and different socket size.

For each of the following processors, state the following: the current generation if applicable, the price, the number of cores, processor speed, and the cache information. Copy a picture of each CPU.

Resources: (You may wish to look at other sites)
http://www.canadacomputers.com/
http://www.intel.com/technology/io/index.htm

a. Core i9
   Generation: 9th generation
   Price: $720
   Number of cores: 8 cores
   Processor speed: 3.6 GHz
   Cache memory information: The cache memory is maximum of 64 GIB, it included 1 controller, 2 channels and has a maximum bandwidth of 39.74 GIB/s.

b. Core i7
   Generation: 8th generation
   Price: $550
   Number of cores: 6 cores
   Processor Speed: 3.7 GHz
   Cache memory information: The cache memory is maximum of 128 GB, and 2 max memory channels, and has a maximum bandwidth of 41.6 GB/s.

c. Core i5
   Generation: 8th generation
   Price: $355
   Number of Cores: 6 cores.
   Processor Speed: 3,6 GHz
   Cache Memory Information: The cache memory is maximum of 128 GB, and has 2 max memory channels, and has a maximum bandwidth of 41.6 GB/s.

d. Core i3
Generation: 8th Generation
Price: $117
Processor Speed: 3.9 GHz
Number of Cores: 4 cores.
Cache memory information: max memory size of 64 GB, maximum 2 channels, and maximum memory bandwidth is 37.5 GB/s.

e. Atom
Generation:
Price: $37
Processor Speed: 2.6 GHz
Number of cores: 4 cores
Cache memory information: maximum memory size is 8 GB, maximum numbers of memory channels are 2 and maximum memory bandwidth is 25.6 GB/s.]

f. Pentium
Generation:
Price: $64
Processor Speed: 3.5 GHz
Number of cores: 2 cores
Cache Memory information: Has 3 MB of cache memory, and a maximum number of memory channels are 2.

g. Celeron
Generation:
Price: $107
Processor Speed: 1.1 GHz
Number of Cores: 2 cores
Cache memory information: Has a cache memory of 4 MB and a maximum numbe of channels are 2.

h. AMD Athlon X4
Generation:
Price: $55
Processor Speed: 3.7 GHz
Number of cores: 4 cores

Cache memory information: Has 2 channels and has a cache memory of 2 MB.

i. AMD FX4
Generation:
Price: $300
Processor Speed: 4.2 GHz
Number of Cores: 4 cores
Cache memory information: Has a total cache memory of 4 MB.

What is the main difference between the ALU (arithmetic logic unit) and the Control Unit of the CPU?

The main difference between the ALU (arithmetic logic unit) and the Control Unit of the CPU is that ALU deals with mathematical calculations whereas the Control Unit main job is to tell the ALU, computers memory,input and output devices to how to respond to the instruction sent to the processor.

ICS 2O0
Unit 1 - Hardware

Explain, using point form in your own words, how a CPU executes program instructions.
Use this site to help you answer:
http://homepage.cs.uri.edu/faculty/wolfe/book/Readings/Reading04.htm
(Answer will be towards the bottom of the article)

1. The control unit fetches (gets) the instruction from memory.
2. The control unit decodes the instruction (decides what it means) and directs that the necessary data be moved from memory to the arithmetic/logic unit. These first two steps together are called instruction time, or I-time.
3. The arithmetic/logic unit executes the arithmetic or logical instruction. That is, the ALU is given control and performs the actual operation on the data.
4. Thc arithmetic/logic unit stores the result of this operation in memory or in a register. Steps 3 and 4 together are called execution time, or E-time.